



NAUTICAL CHART MANUAL - VOLUME 1 - POLICIES AND PROCEDURES
Seventh (1992) Edition

CHAPTER 6 - LANDMARKS

**U.S. Department of Commerce
Office of Coast Survey**



UNITED STATES DEPARTMENT OF COMMERCE

National Oceanic and Atmospheric Administration

NATIONAL OCEAN SERVICE

Office of Coast Survey

Silver Spring, Maryland 20910-3282

JULY 12, 2000

MEMORANDUM FOR: All Cartographers
Marine Chart Division

FROM: Fannie B. Powers
Chief, Quality Assurance, Plans and Standards Branch

SUBJECT: Chapter 6

Effective immediately, the attachment replaces Chapter 6 in the Nautical Chart Manual, Volume 1, Part 2, Seventh (1992) Edition in its entirety.

Chapter 6 is revised as follows:

1. Carto Orders and Memorandums are embedded in the text.
2. Outdated procedures are deleted.
3. Acronyms are revised.
4. Pages are renumbered.

References to Chapter 6 in places, such as the Table of Contents and the Index in the Nautical Chart Manual, will be updated.

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NAUTICAL CHART MANUAL

6 LANDMARKS

6.1 General

A landmark is any fixed natural or artificial object, generally on land, which is prominent from seaward and can be used in determining a vessel's direction or position. The term excludes objects expressly erected for navigational purposes such as [lights](#) or [daybeacons](#).

Prominence is the first requisite for a landmark. Landmarks selected for charting should be visible over a large area from the sea and should be easily identifiable. Because ease of positive identification is also important, an unusual or unique feature may qualify as a landmark because it is easy to identify even if it is not particularly prominent. Prominence of a landmark will vary with the location of the observer and with lighting and atmospheric conditions.

Landmark requirements for small-scale charts must be kept in mind when selecting landmarks for large-scale charts. Landmarks selected for smaller-scale charts must appear on larger-scale charts covering the same area.

6.1.1 General Charting Guidelines

A dense charting of many objects of the same type is seldom useful for navigation purposes. Such multiple charting of objects in close proximity or in a relatively small area without benefit of a discriminating field inspection (for example, the charting of numerous [stacks](#) in a large industrial area near a coastal city) could result in a very confusing display of "recommended" landmarks when viewed from seaward.

Every effort should be made to chart only those objects which are outstanding and readily identifiable by the mariner. The selection of a few easily identifiable stacks with appropriate descriptors may be more useful to the mariner than the charting of many closely spaced stacks. Similarly, the charting of a single radio structure, when part of an array, may be more desirable than the charting of all of the structures, provided the label identifies it as part of a group, e.g., tallest of four, northerly of three, etc.

An object's shape may also be a useful identifier in some instances. A short description of an unusually shaped [water tank](#) (e.g., ball, oblong, ball on tee, etc.) will allow the mariner to distinguish between it and other nearby tanks.

Other sources such as USGS quadrangles and NOS aeronautical charts may be helpful in determining the seaward visibility of objects when in doubt, especially when those objects are not near the coastline and may be obscured by intermediate ground elevations.

Objects of a temporary nature should not be charted. A vertical elevating crane used in building

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construction may be very prominent, but must be presumed to be nonpermanent. However, the building which is being constructed may qualify as a landmark and a field inspection for landmark evaluation should be obtained after construction is completed. Likewise, an exploratory oil-drilling rig must be considered a temporary structure and should not be charted as a landmark (however, it may be charted as a mineral development structure, see [Section 4.13.5](#)). Dredges are sometimes recommended for inclusion as landmarks, but they should not be charted since they are subject to relocation.

The charting of movable objects should be avoided. A gantry crane at a shipyard may be a very prominent feature, but it will not have a fixed geographic position and, therefore, is useless as an aid to the mariner in determining the vessel's position. Shipyards will usually contain other potential landmark objects, and a search should be made or a field inspection requested for suitable substitutes.

Colors describing painted objects are usually not charted because of their relative temporary nature. The material from which an object is built should also not be charted since the mariner usually cannot identify an object in this way even at close range.

A painted name on a [tank](#), [stack](#), etc., is charted only if the letters are large enough to be unusually conspicuous from seaward.

Signs, in general, are not recommended for charting as landmarks. However, an unusually conspicuous sign, especially in an area devoid of other suitable landmarks, may be suitable for charting. If a sign is not significantly elevated, a field inspection will be required to determine its value for daytime and, if brightly lighted, possible nighttime visibility.

Signboards supplying navigational information may be considered as landmarks if, for example, they are used to mark distances along a waterway. The location of signs giving water-level data will also be considered useful and should be charted using the landmark criteria, even if they are not visible from a distance.

Radio structures should be labeled with sufficiently complete information to provide a usable visual landmark as well as a radio aid, where desirable. The strength of AM radio signals, the hours of operation, and the height of radio structures should be taken into consideration when selecting these as landmarks for small-scale charts. This information can be obtained from the Broadcasting Yearbook and other reference material filed in NDB. See [Section 6.2, Radio Stations](#).

Special-use objects shall be charted if requested by a competent authoritative source, even if they are not of landmark value to the mariner. Examples of this type of object would be a permanent survey tower, target, or dredging range marker established by the [USACE](#) for channel maintenance, or an object used by the USCG in buoy placement.

6.1.2 Evaluation of Recommended Landmarks**1. Sources**

Landmark information is received in many forms. Sources acceptable for charting action will include NOS-originated data, as well as data from other organizations or individuals, including the following:

a. Field-inspected data from NOS surveys:

- (1). NOS hydrographic and topographic survey data
- (2). NOS Chart Evaluation Surveys
- (3). NOS Coast Pilot inspections
- (4). NOS small-craft facility field inspections

b. Recommendations by reliable sources as a result of an onsite observation:

- (1). Foreign governments
- (2). U.S. Navy and USCG
- (3). NOS Aeronautical Chart Division obstruction file
- (4). Cooperative charting organizations
- (5). Merchant ships
- (6). Specific data reported by individuals

c. Recommendations from documented sources routinely received by NOS:

- (1). Triangulation data
- (2). USGS quadrangle maps
- (3). USACE surveys
- (4). Miscellaneous letters and survey data

d. Recommendations initiated in MCD as a result of personal observation.**2. Initial Evaluation**

An initial evaluation of a landmark recommendation is conducted by NDB to determine the proposed landmark's usefulness for charting. The recommendation will be accepted if it is the result of an onsite inspection by a reliable source and if the object has been located with sufficient accuracy to provide identification for the processing of any additional data. An inspection from seaward is always desirable.

A report that requires supplemental information (e.g., lacking onsite inspection or accurate location) will be forwarded on the Standard until the required information is received. When received,

the supplemental information should be attached to the original report to ensure that only one entry is made into the documentation system. Additional information can be obtained by a request to the source originator, by a request to another reliable party, or by an office examination of photos, quadrangles, or other sources.

3. Documentation

All landmark recommendations that are determined to be acceptable and are considered sufficiently complete shall be documented for chart application. However, see [Section 3.10. Military Features](#), for security clearance procedures that must be followed for charting landmarks within a military installation.

4. Screening for Notice to Mariner Actions

Charted landmarks reported to be nonexistent shall be considered for announcement in [NM](#). The availability of other landmarks in the vicinity and the prominence of the former landmark should be taken into account in determining the need for such an announcement.

The reporting of newly recommended landmarks or revision of critical data concerning charted landmarks shall be considered for announcement in the NM.

The accuracy of an object's geographic position must be considered when evaluating an item for publication in the NM.

Accurately located objects that are considered important for safe navigation, approximately located objects that are considered essential for safe navigation, and even less accurately located objects that are considered critical for safe navigation shall be considered for NM action.

Accurate positions of navigationally important objects, if not initially available, should be requested immediately. Requests should be made through the Chief, NDB.

5. Follow-Up Proceedings

The reported information shall be examined for completeness and for compliance with NOS policy and requirements. If serious deficiencies are found, this shall be noted and application delayed until the requirements are adequately satisfied.

An accurate position obtained during follow-up proceedings may indicate the need for a security clearance (see [Section 3.10](#)). The source for a feature requiring this clearance must be returned to NDB so that clearance is obtained before chart application.

Additional information on radio transmitting structures, such as the type of transmission, frequency,

and call letters, can be obtained through NDB.

A final evaluation as to the need for an NM action shall be made after considering all information available. If an NM announcement is required, the item shall be referred to NM Update Service after application to all charts.

Accurate positions must be obtained for all objects of landmark value having only approximate locations. The Chief, NDB, shall refer such objects to the RSD for a position.

6. Final Cartographic Evaluation

The final decision on the use of reported data rests with the cartographer at the time of chart application. Only after all the available data is assembled can a clearly useful and effective display of information for charting be determined. The cartographer should keep in mind the previously stated guidelines for charting landmarks.

If the cartographer doubts the value of proposed landmarks or if a more judicious selection of landmarks would increase the chart's usefulness, a field inspection by qualified NOS personnel should be made. A field inspection may also be obtained through the Cooperative Charting Program by request to NSD from the Chief, NDB.

An office evaluation will generally be required when an onsite inspection has not been made or when the objects being reported do not appear to meet the requirements for a navigationally useful landmark.

6.1.3 Accuracy of Position

1. Accurate Position ([B 32](#))

The symbol denoting accurate position (an encircled dot) shall be used to chart an object considered to be located within 10 feet of its correct geographic location or reported accurate to within a tenth of a second (0.1").

The "accurate position" symbol shall be used for charting recommended landmarks whose geographic location has been established by any of the following accurate locating methods:

a. NOS triangulation and photogrammetric methods as required for listing a landmark on NOAA Form 76-40, Nonfloating Aids or Landmarks for Charts, are considered accurate (although a listing is not necessarily a recommendation for charting). Copies of completed NOAA Forms 76-40 should be forwarded to USCG headquarters and the appropriate USCG district office through NDB.

If determined by triangulation, a landmark must be carefully charted by its geographic coordinates using

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as a source the geodetic control data file maintained by NDB. A reference file of triangulation diagrams is also available. These are overprintings of a set of nautical charts and certain USGS quadrangles covering the entire charted coastal areas. Diagrams of States may be requested through the Nautical Data Section.

If determined by photogrammetric methods, a landmark shall be charted using its geographic coordinates as listed on NOAA Form 76-40. Since landmark reports are generally received in advance of final data, the initial application of new landmark information from NOAA Form 76-40 should be clearly recorded by the compiler on the form.

b. NOS field surveys are routinely screened for objects of landmark value. Those determined useful are recorded on NOAA Form 76-40 and become part of the survey records. However, a feature to be charted as a landmark may on occasion be shown only on the NOS topographic or hydrographic survey and may have been located by sextant fix, planetable, or photo plot. Positions of features located in this manner must be carefully scaled for plotting and logging.

c. A landmark's position may be considered accurate if it is listed on a USACE or similarly reliable survey, or any other reliable graphic source (such as a USGS quadrangle).

d. A landmark's position may be based on a carefully scaled value of acceptable accuracy from a large-scale USACE or similarly reliable survey (other than NOS) with unquestioned control. However, it is far better to have the original numerical value used for plotting on the source than a geographic position derived by a scaling method. Thus, every effort should be made to obtain the original numerical value.

e. A landmark's position may be a recording determined by an accurately measured bearing and distance. A geographic position obtained from measurements made by a land surveyor, for example, may meet NOS accuracy standards.

f. A position derived from a scaling method shall be recorded on NOAA Form 76-40 to be documented as a numerical value source. This will provide file recovery for subsequent processing of required follow-up procedures.

The position source, scale, and date must be clearly recorded on NOAA Form 76-40 in the column headed "Method and Date of Location" with the notation "position scaled".

2. Approximate Position ([B 33](#))

The symbol denoting approximate position (a small circle) shall be used to chart landmark objects that do not meet the accuracy guidelines described above, but which are generally considered to be within 100 feet of their correct geographic location. The position of such an object is considered to be of less



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JUNE 12, 2002

MEMORANDUM FOR: All Cartographers
Marine Chart Division

FROM: Fannie B. Powers
Chief, Quality Assurance, Plans and Standards Branch

SUBJECT: Nautical Chart Manual: Correction Pages - Pages 6-7 through 6-30

Effective immediately, the following attachment replaces pages 6-7 through 6-24 in the Nautical Chart Manual, Volume 1, Part 2, Seventh (1992) Edition.

The attachment serves to correct the following illegible items and cartographic errors introduced to the Nautical Chart Manual during its conversion to digital format:

Nautical Chart Manual Volume	Nautical Chart Manual Page	Illegible Item/Error Introduced during Digital Conversion
1	6-8	Quality of graphics distorted.
	6-9	<ul style="list-style-type: none">- Quality of graphics distorted.- Additional approximate landmark symbol erroneously added to “(3) Combination” example.
	6-10 to 6-14	Quality of note and graphics distorted
	6-16	<ul style="list-style-type: none">- Quality of graphics distorted.- The heading: “New York” erroneously missing from New York broadcast station localities .- The initials “Lt” erroneously substituted for the initials “L”.
	6-17	Quality of note and graphics distorted.
	6-18	<ul style="list-style-type: none">- Quality of note and graphics distorted.- The abbreviation for <i>Lights</i>, as provided under the accurate landmark example, is erroneously indicated in upper and lower case.

(continued)

Nautical Chart Manual Volume	Nautical Chart Manual Page	Illegible Item/Error Introduced during Digital Conversion
	6-19 to 6-21	Quality of graphics distorted.
	6-22	<ul style="list-style-type: none"> - Quality of notes distorted. - Figure 6-1a erroneously has two (2) sets of intervals to represent the “Pulse Repetition Interval” of the one (1) set of Loran rates.

The attachment also updates page 6-7 by removing the reference to NOAA Form 76-40 in the second paragraph of item c. NOAA Form 76-40 is no longer used by the Remote Sensing Division to record either scaled or accurate positions.

Pages 6-7 through 6-30 are to be inserted into the Nautical Chart Manual, Volume 1, Part I, Seventh (1992) Edition immediately after page 6-6.

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than third-order accuracy; usually the position will be reported to the nearest second. Note that the method of location may be used as an indication of the recorded accuracy of an object.

Objects of approximate position may be charted only if they are considered essential for safe navigation or of unusual importance.

Acceptable locating methods and sources for charting "[approximate position](#)" landmarks follow:

a. A report from any source determined to have been located by methods that meet the accuracy standards for an "approximate position" landmark may be used.

b. Sextant fix, planetable, and photo plot positions may be of approximate position accuracy and may be transferred by graphic methods. A scaled geographic position will be required for further processing.

c. A scaled value from a reliable source other than NOS, with adequate control, may be used. This source may be a USGS quadrangle or other relatively small-scale source. A scaled value from these sources will not be assumed to meet accurate position requirements according to the NMAS (see [Section 2.16.2](#)) and shall be charted with the approximate position symbolization.

A scaled value may be considered only for interim use until the original numerical value from the originating source can be obtained. It should be clearly indicated as a position requiring further refinement to meet position standards.

d. A position determined by a bearing and distance method will usually be considered an approximate position (or less) although a position accurately and carefully determined by these methods may qualify as an "accurate position".

e. If an object is charted as an accurate position and is reported by another source or NM that it is located in an approximate position, the accurate position shall be maintained unless the new source or NM states that the object has been moved.

3. Inexact Position

An object located with less accuracy than that required by the "[approximate position](#)" standards shall not be charted unless it meets a critical need.

An object determined to be critical for charting and considered to be within 101 to 300 feet of its correct geographic location shall be charted with the "approximate position" symbol. To emphasize the weak

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position, the abbreviation "PA" shall be included as part of the label.

All related records must clearly indicate the requirement for an accurate position.

6.1.4 Labeling of Landmarks

1. Depiction of Accuracy

Not only the landmark symbol, but the landmark label, reflects the accuracy of a landmark's charted position.

a. Accurately Located Objects



These shall be labeled using all capital letters for both the primary name, the description, and the secondary name. The secondary name and the description shall be enclosed in parenthesis.

The primary name is the name chosen as that most likely to identify the object for the majority of chart users. It shall be placed close to the landmark symbol so as to provide clear identification.




The secondary name is an alternate name for the object which may be useful to some marine interests.

The description is an explanatory term which elaborates on the primary name. Both a secondary name and a description are sometimes used for a single object.


(1) Primary and Secondary Names:

-  TOWER (ABAND LT HO)
-  STACK (FLARE)
-  TOWER (DREDGING RANGE)

(2) Primary Name and Description:

-  TOWER (ABAND LT HO)
-  STACK (FLARE)
-  TOWER (DREDGING RANGE)

(3) Combination:

-  STACK (FLARE)
(TALLEST OF THREE)

b. Approximately Located Objects

Objects charted with the "approximate" symbol shall be labeled using capital and lowercase letters for each word of the primary and secondary names. Only the first letter of the first word of the description shall be capitalized. The secondary name and the description shall be enclosed in parenthesis.

(1) Primary and Secondary Names:

- Building (R Lt)
- Tower (Aband Lt Ho)
- Tower (Dredging Range)

(2) Primary Name and Description:

- Marker (Lighted)
- Stack (Taller of two)
- RadioTower (Center of five)

(3) Combination:

- Building (Custom house)
(Westerly of two)

2. General Labeling Guidelines

a. Abbreviations

Names of landmarks should be abbreviated only if they fall in a very congested area. If abbreviated, they must conform to the list of abbreviations and terms in [Section V](#) of Chart No. 1.

b. Names of Buildings

Names of buildings that are well known locally and which are considered important may be shown in parenthesis following the name of the landmark, e.g., "DOME (STATE HOUSE)". For an object that is both are well known and unusually prominent, the proper name of the object may be used as the primary charting name, e.g., "EMPIRE STATE BUILDING". The use of proper names, e.g. "RITZ TOWER", for primary names should be avoided, but they may be useful as secondary names, e.g., "BUILDING (RITZ TOWER)".

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c. Groups of Structures

When two similar, adjacent objects are shown with one landmark symbol, the word "TWIN" is used. If they are charted separately, the word "TWIN" is not used. When only one object of a group is to be charted, its name is followed by a descriptive legend in parentheses, including the number of objects in a group, e.g., "(TALLEST OF FOUR)", "(NORTHEAST OF THREE)", or "(CENTER OF FIVE)".

d. Use of Outline Shape

The outline shape of a prominent structure may be charted to scale if it is relatively large or of particular interest and of landmark value, e.g., the Pentagon or Fort McHenry. Care must be taken to show the shape and position precisely according to source data. Important structures may be charted by outline when considered useful at chart scale even though only a specific part of the structure is recommended as a landmark object.


e. Aeronautical Obstructions

Aircraft obstruction lights are generally considered of secondary importance as a navigational aid. Therefore, they shall not be charted with a light dot and magenta flare unless they are listed in the Light List and given a Light List number.


Nor shall these lights be charted as aeronautical lights. Obstruction lights on landmark objects shall not be labeled unless specifically requested by a reliable source. It is not necessary, in this case, to differentiate between occulting and fixed lights.

Examples:

 RADIO TOWER
(R LTS)

 STACK (FLARE)
(STROBE, R LTS)

An object recommended for charting as a landmark that is identified only as an aircraft obstruction light shall be charted with the appropriate landmark symbol and labeled "Obstruction Light".

 OBSTN
(R LT)

6.1.5 Landmark Classifications

The following classifications of landmarks are defined here for the purpose of standardizing chart terminology and showing acceptable abbreviations (note references to Chart No. 1).

ANTENNA, ANT:



Usually reserved for large reflecting antennas of open or grid-type construction.

The telemetry antenna of a missile or satellite tracking station shall be labeled "ANTENNA (TELEM)", when this information is considered to be important.

Antennas of unknown purpose shall be charted with a description of their shape for visual identification by the mariner.

BUILDING: See [HOUSE](#)

CHIMNEY; CHY:



A relatively small, upright structure projecting above a building to convey smoke. A tall smokestack-type chimney is designated as a stack, not a chimney.

CUPOLA; CUP:



A turret or small dome-shaped tower which rises from a building and is small compared to the building.

DOME:



A large, hemispherical cupola, or a roof that is rounded or many sided.

A dome known to contain radar equipment shall be charted as "DOME (RADAR)". If the radar use is not known, reference to radar shall be omitted.

FLAGPOLE; FP:



A single-staff flagpole rising from the ground and not attached to a building.

FLAGSTAFF; FS:



A flagstaff rising from a building. It is not necessarily the most prominent part of a building for landmark recognition purposes, although it should be retained as a secondary label, when appropriate, e.g., "BUILDING (FLAGSTAFF)".

FLAG TOWER; F TR

A scaffold-like tower on which flags are hoisted, such as a USCG skeleton steel flagpole. The term "signal tower" should not be used on NOS charts.

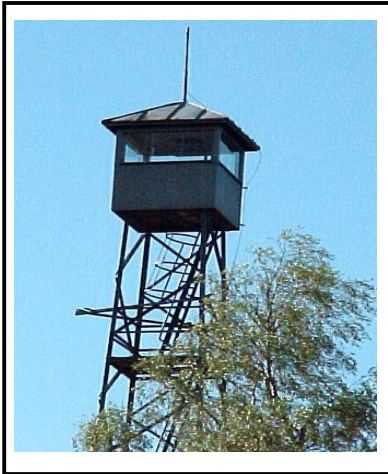
GAS TANK or OIL TANK:

Since gas and oil tanks differ in shape and size from water tanks, they should be identified by the label "GAS TANK" or "OIL TANK". An undesignated tank will be presumed to be water tank. Note, however, that gas and oil tanks are not usually charted with a landmark symbol, but with a solid filled outline or crosshatching.

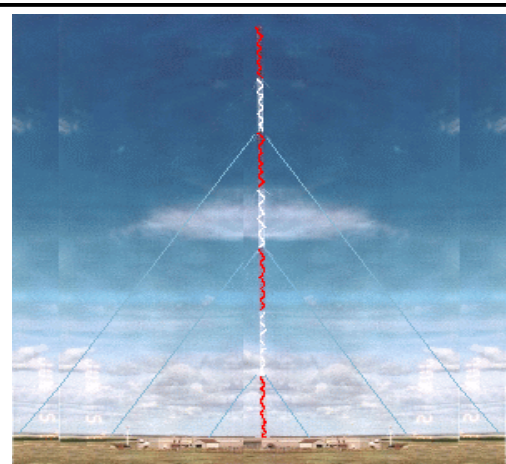
HOUSE or BUILDING; HO; BLDG:

When a building is itself a landmark, it is not desirable to chart a specific point, such as "west gable". The landmark symbol and label "HOUSE" or "BUILDING" may be followed by the description of the point located if it is recommended by the field party, e.g., "HOUSE (WEST GABLE)".

If the structure encloses equipment which may be of special or limited navigational use to the mariner, a one-word description of the use shall follow the primary label, such as "BUILDING (VOR)". ("VOR" stands for very high frequency omnidirectional range.)

LOOKOUT TOWER; LOOK TR:

A tower, usually of open construction, surmounted by a small house in which a watch is habitually kept, e.g., a USCG lookout tower or a fire lookout tower. Lookout towers must be differentiated from observation towers in which no watch is kept.

LORAN STATIONS:

Loran Station
Havre, Montana

LORAN stations shall be charted with the landmark symbol and appropriate label, e.g., "LORAN TOWER". They shall be shown on all LORAN charts, even when not recommended as a landmark.

MICROWAVE TOWER: See [RADIO TOWER \(MICROWAVE\)](#)



Washington Monument

MONUMENT; MON:

The label "MONUMENT" shall be used, rather than descriptive terms such as "obelisk".

Washington, D.C.

OIL TANK: See [GAS TANK](#)

**RADIO MAST; R MAST
RADIO TOWER; R TR:**



Radio masts and radio towers are both structures used to elevate antennas. A radio mast is a very tall, slim structure which is held vertical by guywires. A radio tower is a tall structure, usually of open lattice construction, and always self-supporting. For further information concerning the charting of radio station structures, see 5.11, Radio Stations.

RADIO TOWER KAGT 1340 kHz:



AM commercial broadcast station structures shall include the station's call letters and frequency for use in radio direction finding, e.g., "KAGT 1340 kHz". Radio structures other than AM commercial broadcast stations shall not be labeled with either call letters or the frequency unless they are of known use for marine navigational assistance.

RADIO MAST 1015 FT (TV, FM) (STROBE, R LTS):

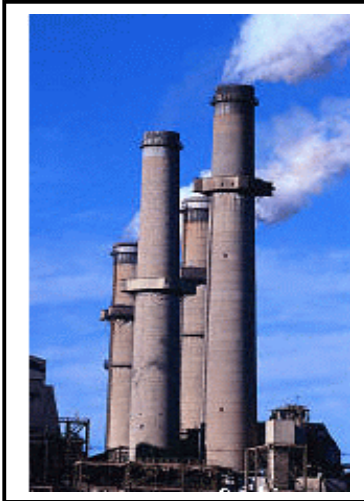
Aircraft obstruction lights may be identified in parentheses in the label, e.g., "(STROBE, R LTS)" if they are recommended for charting by a reliable source.

RADIO TOWER 215 FT (MICROWAVE) or MICRO TOWER

The height of a radio tower or mast above ground level should be included in the label where this information will prove useful, e.g., "1015 FT".

**SPIRE:**

A slender pointed structure surmounting a building. It is rarely broken by stages or other features. The term "steeple" shall not be used. A short pyramid-shaped structure rising from a tower or belfry is not charted as a spire.



STACK

Any tall smokestack or chimney (regardless of color, shape or material) which is more prominent as a landmark than the building connected thereto. The term "chimney" shall not be used to signify this type of structure.

Where waste gas is burned from the stack, as at a refinery or sewage disposal plant, the flame may be significant as a nocturnal landmark and shall be charted as "STACK (FLARE)".



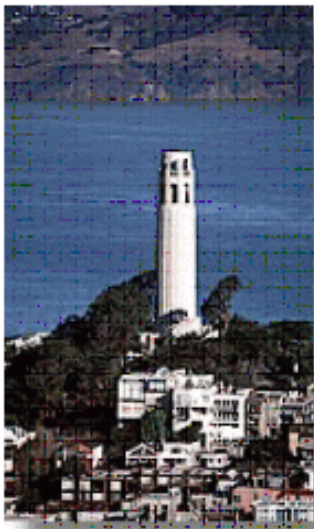
STANDPIPE; S'PIPE:

A tall cylindrical structure in a waterworks system, the height of which is several times greater than the diameter. See also "tank" and "water towers".

TANK:



A water tank elevated high above the ground by a tall skeleton framework or support. It shall be labeled "TANK". The word "Elevated" should not be used since a tank would not be a landmark unless it were elevated. See also "water towers".



Earthquake Tower
San Francisco, California

TOWER; TR:

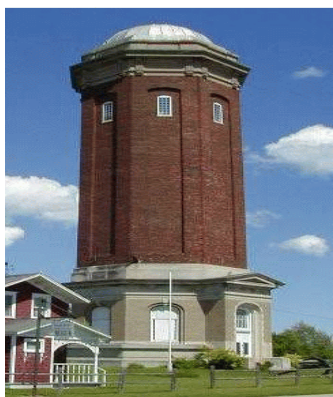
A tower is that part of a structure that is higher than the rest, but having vertical sides for the greater part of the height.

Any enclosed structure, whether or not its sides are vertical, with its base on the ground and high in proportion to its base, is called a tower. See also separate discussions of flag towers, lookout towers, LORAN towers, radio towers, and water towers.



TREE:

Trees are sometimes recommended for charting as a landmark. Such phrases as "lone tree" or "conspicuous tree" should be omitted since only conspicuous trees would be selected as landmarks.



Manistique Historic Water Tower
Manistique, Michigan

WATER TOWER:

A decorative structure enclosing a water tank or standpipe. Its appearance may prevent its being recognized as a water tank or standpipe.

WINDMILL:



Navajo Power Plant
Page, Arizona

A wind-driven mechanism that is both conspicuous and easily recognized.

(The remainder of this page is intentionally blank.)

6.2 Radio Stations ([E 28](#), [E 29](#))

1. General

[Radio towers](#) and [masts](#) used to elevate antennas are particularly useful landmarks on nautical charts. They are usually accurately located, conspicuously tall, and easy for the mariner to identify even at night; moreover, they are generally found outside of congested areas. [AM radio stations](#) are also charted because they are useful for radio direction finding. Weather broadcast stations are charted because they provide valuable information to mariners.

A radio tower is a self-supporting latticed structure while a radio mast is a tall structure held vertical by guylines. Radio signals can be transmitted or received from similarly shaped structures or from a single structure.

The purpose of a structure cannot always be ascertained by observing its size and shape nor the configuration of the antennas.

Structures more than 200 feet (61 meters) above ground level are usually marked with [aircraft obstruction lights](#), thereby increasing their value as aids in nighttime navigation. These may be fixed or occulting red lights or strobe lights. The obstruction lights may be included in parentheses in the accompanying label, e.g., "(STROBE, R LTS)", if recommended for charting by a reliable source.

2. References

Information concerning radio stations may be obtained from various references maintained by NDB for chart planning and general evaluation, including the following:

1. Standard Broadcast Stations, U.S., lists data for AM broadcast stations; it is issued by the Federal Communication Commission (FCC) every 6 months.
2. "AM Change List" provides revisions to the above and is issued by the FCC every week.

Since the information listed in both these publications originates from construction permits, it may be pending or unreliable and should be used with caution.

3. "Directional Antenna Sheets," another FCC publication, lists the stations composed of more than one antenna and shows array specifications and other data.

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4. The privately published "Broadcasting Yearbook" and the "TV Fact Book" are also useful references.

6.2.1 AM Station

Transmitting structures for commercial AM broadcast stations shall be charted and labeled with call letters and frequency for use in radio direction finding. When provided with this identification, mariners with radio direction finders can determine their position by taking bearings to these structures. However, the distance an AM radio wave must travel over land before reaching water distorts the wave, making it less accurate for taking bearings than waves from marine radiobeacons. The height above ground level shall be included in the label when it is significant for visual recognition.

Examples of charted AM broadcast stations are shown below:

Accurate Position

⊙ RADIO TOWER
WMAL
630 kHz
R LTS)L

Approximate Position

○ Radio Mast 483 Ft
WSSO
1230 kHz
(R Lts)

On smaller-scale charts, AM broadcast stations shall be selected for charting that will provide the mariner with both visual assistance and radio direction finding in coastal navigation. On charts smaller than 1:250,000 scale on the west coast and smaller than 1:150,000 scale elsewhere, the selection shall be made from stations shown on larger-scale charts that have higher-powered omnidirectional transmissions and that broadcast 24 hours a day. Where possible, at least one transmitting structure should be selected for every 30 to 40 miles of coast.

In very congested areas, a list of AM radio stations may be included on the chart to prevent the elimination of important topography or hydrography. In this case, only the landmark symbol, station call letters, and height (when significant) shall be charted at the position of the transmitter. The list shall include the station call letters, frequency, locality, and any critical special information, such as "daytime only," etc.:

**NATIONAL OCEAN SERVICE
Office of Coast Survey
Marine Chart Division**

CARTOGRAPHIC ORDER 010/02

June 24, 2002

FILE WITH NAUTICAL CHART MANUAL, VOLUME 1, PART 2, SECTION 6.2.1

TO: All Cartographers
Marine Chart Division

SUBJECT: Caution Note - "Limitations on the use of radio signals"

APPLICATION: All Affected Nautical Charts

The U.S. Coast Guard has progressively discontinued individual marine radiobeacons through Local Notice to Mariners as they phase out the marine radiobeacon system. The U.S. Coast Guard now advises that all marine radiobeacons have been discontinued.

Accordingly, the content of the descriptive "Limitations on the use of radio signals" Caution note associated with marine radiobeacons and radio signals shall be revised.

Effectively immediately, the content of the Caution note shall be revised to eliminate references to marine radiobeacons. The note shall be in 7 pt. Swiss Light type, 2" (Preferred) or 3 1/2" (Optional) wide, and in black. The revised note is as follows:

CAUTION

Limitations on the use of radio signals as aids to marine navigation can be found in the U.S. Coast Guard Light Lists and National Imagery and Mapping Agency Publication 117.

Radio direction-finder bearings to commercial broadcasting stations are subject to error and should be used with caution.

Station positions are shown thus:

⊙ (Accurate location) o (Approximate location)

CAUTION

Limitations on the use of radio signals as aids to marine navigation can be found in the U.S. Coast Guard Light Lists and National Imagery and Mapping Agency Publication 117.

Radio direction-finder bearings to commercial broadcasting stations are subject to error and should be used with caution.

Station positions are shown thus:

⊙ (Accurate location) o (Approximate location)

The following attachment replaces Pages 6-23, 6-24, 6-25, 6-26 and 6-27 in the Nautical Chart Manual, Volume 1, Part 2, Seventh (1992) Edition. Section 6.3.1, Marine Radiobeacons (S 10, S 11, S 12) has been deleted in its entirety. The attachment also revises Page IV-20e in the Nautical Chart Manual, Volume 2, Seventh (1992) Edition.

Revisions to the Notes Cell Library have been made and both sized notes are available for immediate application.

Revisions to the Table of Contents and the Index will be contained within the next version of those documents.

Attachment

Nicholas E. Perugini
Captain, NOAA
Chief, Marine Chart Division

**NATIONAL OCEAN SERVICE
Office of Coast Survey
Marine Chart Division**

CARTOGRAPHIC ORDER 017/03

July 15, 2003

FILE WITH NAUTICAL CHART MANUAL, VOLUME 1, PART 2, SECTION 6.2.3

TO: All Cartographers
Marine Chart Division

SUBJECT: National Weather Service Broadcasts from USCG “High Sites”

APPLICATION: All Applicable Nautical Charts

Effective immediately, the attachment shall replace pages 6-23 through 6-28, Volume 1, Part 2, Section 6.2.3, Weather Broadcast Stations, and pages IV-20o and IV-20p, Volume 2, Appendix IV: Miscellaneous References, of the Nautical Chart Manual, Seventh (1992) Edition.

National Weather Service warnings, watches, forecasts and other hazard information are now broadcasted from NOAA Weather Radio stations installed at USCG High Sites on Alaskan mountain tops, points of land along the coast and islands. These broadcasts are reportedly received up to 100 miles away. These stations need not be distinguished from stations having reception ranges of 20 to 40 miles listed in the current “NOAA VHF-FM WEATHER BROADCASTS” note. However, the title and text of this note have been changed to regard the increase of reception ranges for stations located at high elevations.

Revisions to the Notes Cell Library have been made and the notes are available for immediate chart application.

This cartographic order incorporates all pertinent information from the Desk Reference Guide, Volume III, Unit Code 690, Weather Information.

Attachment

Alexandra B. Heliotis
Acting Chief, Marine Chart Division

COMMERCIAL RADIO BROADCAST STATIONS			
Call Letters	Frequency (kHz)	Locality	Remarks
CONNECTICUT			
WFIF	1500	Milford	
WICC	600	Bridgeport	
WNAB	1450	Bridgeport	
WMMM	1260	Norwalk	
WNLK	1350	Norwalk	
WSTC	1400	Stamford	
WGCH	1490	Greenwich	
NEW YORK			
WVOX	1460	New Rochelle	
WCBS	880	New York City (High Island)	
WNBC	660	New York City (High Island)	
WGSM	740	Huntington (Long Island)	

The following caution note shall be included on all charts showing AM radio broadcast stations:

CAUTION

Limitations on the use of radio signals as aids to marine navigation can be found in the U.S. Coast Guard Light Lists and National Geospatial-Intelligence Agency Publication 117.

Radio direction-finder bearings to commercial broadcasting stations are subject to error and should be used with caution.

Station positions are shown thus:

⊙ (Accurate location) ○ (Approximate location)

CAUTION

Limitations on the use of radio signals as aids to marine navigation can be found in the U.S. Coast Guard Light Lists and National Geospatial-Intelligence Agency Publication 117.

Radio direction-finder bearings to commercial broadcasting stations are subject to error and should be used with caution.

Station positions are shown thus:

⊙ (Accurate location) ○ (Approximate location)

The note shall be in 7 pt. Swiss Light type, 2" (Preferred) or 3 1/2" (Optional) wide, and in black.


6.2.2 Other Commercial Stations


All radio structures should be labeled as to type of use where this information can be obtained. This will advise the mariner of their possible use for radio direction finding. A radio structure that serves several purposes should be labeled for each known purpose.

The [height above the shoreline datum](#) of all commercial radio structures should be included in the identifying label when this is considered significant for visual sighting.

Radio structures other than commercial AM broadcast stations shall not be labeled with either call letters or the frequency unless they are of known use for marine navigational assistance.

Examples of how commercial stations other than AM stations are charted are shown below:

 RADIO MAST 862 FT
(TV)
(STROBE, R LTS)

 RADIO TOWER 315 FT
(FM, MICROWAVE)
(R LTS)

6.2.3 Weather Broadcast Stations

Definition: **WEATHER BROADCAST STATIONS.** Weather broadcast stations are radio transmittal sites that continuously broadcast NOAA Weather Service weather reports.

General Requirements

NOAA weather radio broadcast station positions shall be charted if they fall within the limits of a chart.

NOAA's National Weather Service operates a network of VHF-FM weather broadcasting stations known as NOAA Weather Radio along the coast that provides mariners with broadcasts of warnings, watches, forecasts, and other hazard information 24 hours a day. The range of reception for most stations is 20 to 40 nautical miles, but may vary due to the line-of-sight transmission characteristics of the frequency, the transmitting and receiving antenna heights, intervening obstructions, signal strength, receiver sensitivity, etc. Under favorable conditions, a station's broadcast range may extend to more than 100 nautical miles (e.g., Hawaii and U.S. Coast Guard sites in Alaska).

The National Weather Service is of the opinion that stations need not be distinguished based on potential operating range.

Feature Recommendation for a Notice to Mariners

A newly applied, revised, or deleted NOAA radio weather station position or NOAA weather station information shall be evaluated for a Notice to Mariners.

Location and Orientation on the Chart

Weather radio towers shall be charted in their exact geographic positions as depicted in the source material.

Size and Shape

NOAA weather radio station positions shall be charted with the appropriate Chart No. 1 symbol (B32, B33).

Labels and Notes

When a NOAA weather radio broadcast antenna position on a tower is charted, a secondary label indicating that it is a weather radio antenna and the station call letters shall be charted in parenthesis. The label for an accurate positioned landmark shall be charted with black 6 pt. Swiss Regular type. The label for an approximate positioned landmark shall be charted with black 6 pt. Swiss Light type. For example:

	RADIO TOWER 262 FT WEATHER KAC-64 630 MHz (R LTS)		Radio Tower Weather KHB-43 162.55 MHz (R Lts)
---	--	---	--

The following note, 2" wide, shall be included on all coastal charts (1:150,000 scale and larger) and other charts that provide the only coverage for a particular area of U.S. waters. The stations listed in the note would include all those broadcasting to navigable areas of the chart. The note shall be charted with black 7 pt. Swiss Light type.

Example:

NOAA WEATHER RADIO BROADCASTS

The NOAA Weather Radio stations listed below provide continuous weather broadcasts. The reception range is typically 20 to 40 nautical miles from the antenna site, but can be as much as 100 nautical miles for stations at high elevations.

Seattle, Wash.	KHB-60	162.55 MHz
Puget Sound, Wash.	WWG-24	162.425 MHz

This note shall not be charted on Small-Craft Nautical Charts except for cases where a [Conventional](#) Nautical Chart is also used as a base for a [Small-Craft](#) Nautical Chart.

Weather information notes shall be added or revised when necessary.

The minimum receivable transmitting range shall be used when charting radio information.

Color and Screening

NOAA weather radio station location symbols and NOAA WEATHER RADIO BROADCASTS notes shall be charted with black.

Feature Removal from Chart

The secondary label indicating that it is a weather radio antenna and the station call letters shall be removed from a chart if the National Weather Service or another authoritative source provides conclusive evidence that the broadcasting antenna doesn't exist on the supporting feature. Remove remaining symbolization and label, if supporting feature is no longer of landmark value. Non-authoritative sources (e.g., U.S. Power Squadron and U.S. Coast Guard Auxiliary Reports) do not have sufficient authority to declare this feature nonexistent or related weather information incorrect.

6.3 Marine Radio Aids

Radionavigation systems are important because they extend navigational assistance to areas that are beyond the range of visual aids to navigation and they replace visual observations at closer distances when fog or other thick weather exists. Such systems allow mariners to fix a vessel's position at sea far from coastal lights and landmarks. Many radionavigation systems provide more accurate position fixing than celestial observations, but their real advantage is that they do not require clear skies and a visible horizon to be effective.

Medium-frequency radio direction finders onboard ships enable measurement of the bearings of radio transmission from other ships, aircraft, shore stations, aeronautical radiobeacons and coastal radio stations.

In general, good radio bearings will not be in error by more than 2° for distances under 150 nautical miles. However, due to differences in the conducting and reflecting properties of land and water, radio waves crossing a coastline at an oblique angle or passing over rough terrain undergo distortion. These factors should be considered when charting radio aids for use in marine navigation.

See also [Section 6.2.1, AM Stations](#); [Section 6.4, Aeronautical Radio Aids](#); [Section 6.4.1, Aeronautical Radiobeacons](#).

6.3.1 Section no longer exists

6.3.2 Racons ([S 3.6](#))

A racon (from “**RA**dar **beaCON**”) is a radar transponder beacon which emits a characteristic signal when activated by the emissions of a ship’s radar. This distinctive signal can provide bearing, range and identification information. The signal may be coded to provide a Morse code or other identification symbol on the radar display.

Generally, the racon antenna will be located on an existing light structure and shall be charted with a 7.1-mm diameter magenta circle centered on the light dot. If the antenna is not located on a light structure, it shall be charted with a black “position accurate” landmark symbol and a 7.1-mm diameter magenta circle centered on the landmark symbol. When located on a fixed structure, a label in 6 pt. Swiss Regular black type shall be placed adjacent to the symbol. The label shall be in 6 pt. Swiss Regular Italic black type when the racon is located on a floating aid. The label shall include “RACON” followed by the Morse identification code as stated in the Light List.

6.4 Aeronautical Radio Aids

Aeronautical radio aids should be carefully evaluated for their value as a radio aid or landmark for marine navigation. Usually these aids are some distance from the shoreline and would be of limited value.

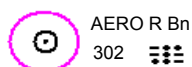
6.4.1 Aeronautical Radiobeacons ([S 16](#))

Aeronautical radiobeacons may be of value for fixing a position at sea in areas void of other radio aids. They are most useful if the service is available continuously or at least at specified hours, if they are located in coastal areas, and if there is no rough terrain between the radiobeacon and the coast since a nonuniform propagation path may render bearings unreliable.

It is impossible to predict the extent to which land effect may render mariners’ receptions of the bearings of these beacons unreliable. The inclusion of aeronautical radiobeacons in National Geospatial-Intelligence Agency Publication No. 117 does not imply that the beacons have been found reliable for marine use.

An aeronautical radiobeacon antenna shall be charted with a black “[position accurate](#)” landmark symbol and a 7.1-mm diameter magenta circle centered on the landmark symbol. A label in 6 pt. Swiss Regular black type shall be placed adjacent to the symbol and clear of the magenta circle. The label shall include the abbreviation “AERO R Bn” and the frequency and characteristics of the radiobeacon.

Example:



6.4.2 VHF Omnidirectional Ranges

VHF Omnidirectional Range ("Omni" for short), is an aircraft navigation system that has some application to marine navigation. Omni signals are, as the name suggests, radiated in all directions, thus enabling the user to get a very precise bearing on the transmitting station.

Ranges are quite limited for surface vessels due to their use of VHF frequencies. Nevertheless, many Omni stations are close enough to the coastline that they can be received at sea. Omni is thus most useful for "landfall navigation" or for obtaining a line of position during coastal passage.

Due to their limited range, Omni stations shall not be charted unless recommended by a reliable source. Moreover, they shall be charted as a visual aid rather than a radio aid.

The appropriate landmark symbol shall be charted with the label "ANTENNA (VOR)." (VOR stands for "very high frequency omnidirectional range.") Accurate positions for the antennas of omni stations are available from the National Geodetic Survey Division.

6.5 Radionavigation Systems**6.5.1 LORAN-C**

LORAN-C is a low-frequency, pulsed, hyperbolic navigation system managed and operated by the USCG. It is available for use by any vessel in the coverage area carrying the appropriate receiving apparatus. The propagation distances and the stability of the propagated waves give LORAN-C a range adequate for ocean and coastal navigation.

In 1974, the Secretary of Transportation approved a requirement for a 1/4-nautical-mile navigational position fix accuracy of 95 percent (2 drms) and availability exceeding 99.7 percent of the time.

LORAN-C lines of position are shown on selected NOS charts at the request of the USCG. NGA has provided the geographic positions of master and secondary stations and other transmission constants as well as correction factors.

LORAN-C lattices, generated using data provided by NGA, are normally computed using correction factors that assume an all-seawater path for the propagated wave. This correction is called a secondary phase factor (SF). NGA also provided corrections for each lattice.

The accuracy of the position obtained from a particular LORAN-C reading is better where lattice lines are closely spaced and the angle of intersection between lattices approaches 90 degrees. In the vicinity of the baseline between the master and secondary station within a zone extending about 20 microseconds either side, the readings are inaccurate.

LORAN C is not recommended for use in inshore bays, rivers, and protected harbors.

LORAN-C GENERAL EXPLANATION

LORAN-C FREQUENCY 100kHz
PULSE REPETITION INTERVAL

9960 99600 Microseconds

STATION TYPE DESIGNATORS: (Not Individual station letter designators).

M.....Master
W.....Secondary
X.....Secondary
Y.....Secondary
Z.....Secondary

EXAMPLE: 9960-Y

RATES ON THIS CHART

9960-W 9960-X 9960-Y 9960-Z

Figure 6-1a

Loran - C correction tables published by the National Geospatial-Intelligence Agency or others should not be used with this chart. The lines of position shown have been adjusted based on survey data. Every effort has been made to meet the 1/4 nautical mile accuracy criteria established by the U.S. Coast Guard. Mariners are cautioned not to rely solely on the lattices in inshore waters.

Figure 6-1b

The Loran-C lines of position shown on this chart are based on assumed all sea water signal paths. They are not adjusted for overland signal transmission delay.

Figure 6-1c

All LORAN-C charts will have at least one and preferably two LORAN-C linear interpolators. They are designed to aid in plotting LORAN-C readings between charted lines of position. Space permitting, they should be placed in diagonally opposite corners of the chart. Second preference is to place them along opposite edges of the chart, or somewhere within the body of the chart.

Section 6.5.1

NAUTICAL CHART MANUAL

Interpolators are available in two sizes and four type arrangements. Use them in the upper-left, upper-right, lower-left, and lower-right chart corners, respectively. The large size is preferred. The small size shall not be used if the spacing of LORAN-C lines exceeds the size of the interpolator.

All LORAN-C charts will have the marginal legend "LORAN-C OVERPRINTED" displayed next to each chart number.

6.5.2 Global Positioning System

The Federal Radionavigation plan has designated the Global Positioning System (GPS) as the primary navigation system of the U.S. Government.

GPS position fixes are available continuously and worldwide.

The GPS uses a series of satellites operating in various nominally circular orbital planes and ground control stations. The satellites transmit on two frequencies, thus permitting a correction to be made for propagation delays in the ionosphere.

The position fix is achieved by determining the distance from the user to selected satellites. The pseudo range measurement is the propagation time from the satellite to the user based on the predicted time of transmission. Three pseudo range measurements are sufficient to define a position for a user who is restricted to the earth's surface.

GPS is operated by the U.S. Air Force and provides extremely accurate positioning.

Differential GPS (DGPS)

The U.S. Coast Guard operates marine DGPS in U.S. coastal waters. DGPS enhances GPS using an additional correction (differential) signal. This correction signal improves the accuracy of the GPS and can be broadcast over any authorized communication channel.

DGPS compares the GPS determined position of a reference station with the station's surveyed geodetic position. The differential information, obtained from the error in fix position is transmitted to user receivers by radio or other means.